



## DEVELOPMENT OF A BONE GRAFTING DEVICE FOR PEDIATRIC CRANIOFACIAL DEFECTS

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With the complications that arise when using rigid metal fixations for treating craniofacial defects, the emergence of bioresorbable fixations have been used commonly to decrease the complications. In addition, rigid metal fixations must be removed from pediatric patients through a second invasive surgery because they have developing skulls that increase the risk of fixation migration. In my work, a bioresorbable fixation device that allows for storage of bone grafts was designed (Fig. 1). The cell adhesion properties of poly-lactic-co-collide (PLG) and hydroxyapatite (HA), two materials commonly used in craniofacial reconstruction, were also experimented. The results of the cell culture experiments helped us determine that PLG was the optimal material to 3D print our bone grafting device we designed using SolidWorks. The dimensions of the 3D printed models were tested via in vitro surgery on a pig skull (Fig. 2). This work ultimately demonstrated the final design for the bone grafting device that we plan to use in a future animal study. The findings in this study brings the research lab a significant step closer towards using the bone grafting device for upcoming animal studies and creating a better treatment option for treating craniofacial defects in pediatric patients.

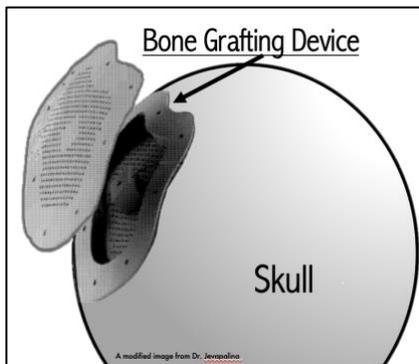


Figure 1: Illustration giving an example of the bone grafting device implanted in a skull. Note that it is porous to allow vasculature access, it has an overhang for screws to attach the device to the skull, and a reservoir for storing osteogenic materials.

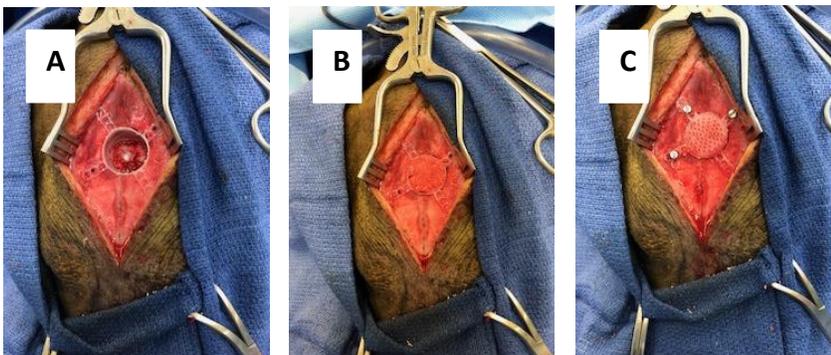


Figure 2: **A)** Image showing the 3D printed model made out of PLG. Here it is inserted into a pig skull defect made by a craniofacial surgeon. **B)** The same implant with bone graft shavings inside the reservoir. **C)** The same implant with the corresponding lid that was 3D printed and 3 screws to secure it to the skull.